G.O., No. 630 I.

DATED 20th August 1901.

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[Despatch Abstract.]

Review of Irrigation in India in 1899-1900.

Endorsement by the G. of I., forwarding copies of its ——, Commns to the officers concerned.

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Indexed. 24/8

11/3/1

தமிழ்நாடு ஆவணக்காப்பகம்

பாதுகாப்பு (Pri) பிரிவு பணி எண் : 214 - S6

செப்பனிட்டவரின் பெயர் : - D. கலைவாணி

ஆவணத்திலுள்ள மொத்த தாட்கள் : - 15

செப்பனிட்டு முடித்த நாள் : - 23-4-2021

செப்பனிட்டவரின் கையொப்பம் : D. கலைவாணி

--- சரிபார்க்கப்பட்டது---

22/7/21

பணி வழங்கிய எழுத்தர்
(Issue Clerk)

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26/4/2021

பிரிவுத் தலைவர்

No. 859 C. W. I.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

CIVIL WORKS.

Irrigation.

Simla, the 26th July 1901.

Review of Irrigation in India in 1899-1900.

Read—

Note by A. R. Becher, Esq., Accountant General, Public Works Department, upon the accounts of Revenue and Expenditure of Irrigation Works in India for 1899-1900.

Provincial Revenue Reports of Irrigation Works for 1899-1900.

Irrigation Works are divided into two main classes, Major and Minor Works, the former being sub-divided into (I) Productive and (II) Protective Works. Capital and Revenue accounts are kept for all Major Works, and the revenue due to them, whether directly, in the form of water rates and miscellaneous receipts, or indirectly on account of enhancements of land revenue due to irrigation are shown in the annual Finance accounts. In the case of Minor Works direct revenue receipts only appear in the Finance accounts, the i[illegible] revenue being included in the receipts under the head of Land R[illegible] As regards expenditure the Finance accounts show all direct charges [illegible] classes of works, but not the indirect charges on account of capital [illegible] abatements of land revenue and of leave and pension allowances [illegible]ant General's note, showing the financial position of the works in [illegible], is therefore based on the Finance accounts as regards all revenue [illegible] direct expenditure on Major Works and all direct revenue receipts [illegible] expenditure on Minor Works, and on the Administrative accounts and Revenue Reports of the Public Works Department in respect of the indirect revenue due to Minor Works, indirect charges to both Major and Minor Works, and all other particulars such as the areas irrigated and the rates of assessment and maintenance.

Major Works.

2. The most important irrigation works in India are those classed as Productive, or works the capital cost of which has been wholly or mainly provided from loan funds, in the expectation that the works would prove directly remunerative, and that the net revenue derivable from them would fully cover all charges for interest within a reasonable time after the completion of the works. This expectation has not been realized in respect of any of the four Productive works which have been constructed in Bengal, and of the seven in the Bombay Deccan and Gujarat, and also of two works in Madras, the Kurnool-Cuddapah canal and the Barur Tank Project. The capital outlay recorded against these thirteen works to the end of the year under review amounted to Rs. 9,73,85,398, on which the net revenue realized during the year yielded a return of 0·79 per cent. only, the corresponding returns for the years 1898-99 and 1897-98 being 0·71 and 0·94 respectively. The interest charges to the end of the year had exceeded the net revenue by Rs. 8,35,80,611, the excess for the year being Rs. 30,37,749. The area irrigated by these works during the year amounted to 836,177 acres.

The unfavourable financial results on these thirteen wo[illegible], more than balanced by those attained on the twenty two other P[illegible]s now in operation, the net revenue on which during the year [illegible]v was equivalent to a return of 9·42 per cent. on the capital outlay. [illegible]ll the thirty five works together the capital cost to end of the year a[illegible]ed to Rs. 32,89,57,022, and the net revenue to Rs. 2,25,91,710, the net re[illegible] being 6·87 per cent. The net revenue for the year exceeded the interest cha[illegible]ge by Rs. 1,01,55,867. These figures do not include the capital cost of the sectnns of the Sirhind and Western Jumna canals in the Punjab which has been met by contributions from Native States, or the net revenue creditable thereto.

3. These results are shown separately by Provinces in the following statement which also includes the transactions in the Punjab Native States. The totals are brought into comparison with those of the previous year, and also with those of the famine year of 1897-98, in which the corresponding totals were in excess of all previous records.

Province.	Number of works.	Area irrigated.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Percentage of net revenue on capital outlay.
		Acres.	Rs.	Rs.	
Irrigation.					
Punjab	6	3,735,529	8,68,17,532	88,90,554	10·24
North Western Provinces ...	5	2,616,872	8,28,56,978	63,91,209	7·71
Madras ...	8	2,686,874	6,72,87,979	54,59,527	8·12
Sin[illegible]	5	808,140	1,67,61,548	11,56,907	6·90
Bom[illegible]	7	26,371	1,09,78,486	2,68,317	2·44
Bengal [illegible]	3	727,026	6,16,39,257	4,17,120	0·68
Do. [illegible]	*1	...	26,15,242	8,076	0·31
Total Irrig[illegible]tion, Imp[illegible]	[illegible]35	10,600,812	32,89,57,022	2,25,91,710	6·87
Native Stat[illegible]	†	491,337	1,51,86,970	12,07,415	7·95
Grand total In[illegible] and Native States,—					
1899-1900 ...	35	11,092,149	34,41,43,992	2,37,99,125	6·92
1898-99 ...	34	9,964,921	33,08,81,149	2,25,04,533	6·80
1897-98 ...	34	10,340,576	32,73,68,760	2,45,36,733	7·50

* Hijili Tidal Canal which is a purely navigation work.
† Part of the works in the Punjab.

Two new works were brought into operation during the year under review, *viz.*, the Jamrao canal in Sind, and the Fattehpur branch of the Ganges Canal in the North-Western Provinces; on the other hand the number of works in Madras has been reduced from 9 to 8, by the amalgamation of the Sangam-Anicut project with the Penner River Canals, of which system it forms a part.

4. All Provinces have contributed to the very satisfactory increase of 751,573 acres as compared with the area irrigated in 1897-98, with the exception of Bombay (Deccan and Gujarat) where a decrease of 6,700 acres is shown, but the principal increases have been in the Punjab, the North-Western Provinces and Sind. The areas in Bengal and the North-Western Provinces were, however, exceeded in the famine year 1896-97 when they stood at 805,387 and 2,758,600 acres respectively, and the Madras area was exceeded by 5,943 acres only in 1898-99. The areas in the Punjab and Sind were in excess of all previous records.

The total value of the crops irrigated from productive works during the year is estimated at Rs. 34,98,57,579, which is slightly in excess of the total capital cost.

5. The area irrigated by the productive works in the Punjab exceeded the previous record of 1897-98 by 309,525 acres. An increase occurred, however, only on two works, the Chenab and the Sirhind canals. On the former canal the development of irrigation continues to be very remarkable. The area recorded in 1897-98 was 810,000 acres, but rose in the year under review to 1,353,223 acres, and there is no doubt that this area will be considerably exceeded in future. The increase in the Sirhind canal amounted to 164,487, of which 96,127 acres occurred on the Native States Branches, and the area irrigated on these branches corresponded more closely with the share of the supply assigned to the States than has hitherto been the case. This indicates an improvement in the management of the irrigation in the States which is very satisfactory.

The increase of 707,710 acres on these two canals was partially balanced by a decrease on the four other productive works in the Punjab, which amounted in the aggregate to 398,185 acres. This decrease was entirely due to the short supply in the rivers Jumna, Sutlej and Ravi. The decrease in the case of the Sidhnai canal is very remarkable. In 1897-98 the area irrigated amounted to 185,709 acres, but only 26,265 acres were recorded during the year under review. This is the smallest area which has been irrigated since the first year in which the canal was in operation (1886). This canal has hitherto been one of the most remunerative in the Punjab. During the twelve years ending 1898-99, the return on the capital outlay has varied from 10·88 per cent. as a minimum to 22·28 per cent., but in 1899-1900 the working showed a loss of 4·68 per cent. The explanation is that the river supply failed almost entirely, water being available for only 117 days in the year as compared with an average of 245 days during the previous ten years.

The return on the capital expenditure by Native States on the Sirsa branch, Western Jumna Canal and on the Sirhind Canal, amounted to 7·95 per cent., which is the highest yet recorded. The Patiala section of the Sirsa branch has always been remunerative, but the financial prospects of the Native States branches of the Sirhind canal were for many years very unfavourable. Since 1896-97, however, the returns have varied between 5½ and 6½ per cent., and amounted to 7·55 per cent. during the year. The financial success of these branches appears to be now satisfactorily established, while their great protective value is shown by the fact that nearly half a million acres were irrigated from them in this year of drought.

6. The total area irrigated by productive works in the North Western Provinces is second only to that of 1896-97, but as in the Punjab the conditions of supply in the rivers were very unfavourable. The rains practically ceased in the beginning of August in most of the canal districts and from then until the middle of January the demand for water was intense, but the supply in the Ganges was the lowest ever known. The fact that so large an area was successfully matured must be regarded as very satisfactory.

The new Fattehpur branch, Ganges canal, was brought into operation during the year, and 23,280 acres were reported as irrigated.

7. The returns in Madras are as usual heavily weighted by the unremunerative Kurnool-Cuddapah canal, which paid only 0·29 per cent. on its capital cost of Rs. 2,17,26,872, during the year under review. Although this work is never likely to be remunerative there has been a marked and satisfactory improvement during the last four years. The average annual irrigation during the five years ending 1895-96 was only 32,160 acres, and the gross revenue only just covered the working expenses. During the famine year of 1896-97, 87,226 acres were irrigated. The area fell to about 48,000 in each of the two following years, but rose again to 77,216 acres in the year under review. The Periyar project on which irrigation commenced in 1896-97 with an area of 63,751 acres has not yet proved remunerative but appears to be developing satisfactorily, the area having increased gradually to 129,232 acres in 1899-1900, when the net revenue yielded a return of 2·47 per cent. on the capital outlay.

8. In Sind the Jamrao canal was opened in November 1899 and 8,160 acres were irrigated before the close of the year. The large increase in the total irrigated area in this Province is satisfactory, but full particulars cannot be given as the revenue report has not yet been received.

9. The area irrigated in the Bombay, Deccan and Gujarat was slightly less than in the two preceding years, but the return on the capital outlay was higher, having risen from 1·28 per cent. in 1897-98 to 2·44 per cent. in 1899-1900. This is due to an increasing percentage of the higher class crops.

10. In Bengal the irrigated area was above the average. The Sone canals yielded a net revenue of Rs. 4,96,114, equivalent to a return of 1·85 per cent. on the capital cost, but as usual the gross revenue on the Orissa and Midnapore canals did not fully cover the working expenses. The Hijili canal which is purely a navigation canal paid 0·31 per cent. only on the capital cost. The navigation receipts on the Bengal canals have suffered from the completion of the Bengal-Nagpur railway.

11. In addition to the 35 Productive works now in operation five new works were under construction during the year, *viz.*, the Jhelum canal in the Punjab, the Mandalay canal in Upper Burma and the Dad, Naulakhi and Nasrat canals in Sind. The total outlay on these works to the end of the year (excluding interest charges) amounted to Rs. 72,14,441 of which Rs. 44,29,965 were expended during the year. In addition Rs. 49,17,406 were spent on works now in operation, principally on extensions or improvements which are likely to prove remunerative and to increase the efficiency of these works. The total capital expenditure during the year therefore amounted to Rs. 93,47,371 against Rs. 69,49,944 in the previous year.

It is anticipated that the two principal works now under construction, the Jhelum and Mandalay canals, will commence irrigation in 1901-02.

12. Protective Irrigation works are those that have been sanctioned in consideration of their value as famine protective works, but without any expectation of their becoming directly remunerative. Funds for their construction have, therefore, not been borrowed, but are provided from the famine grant. There are at present five of these works in operation, particulars of which are shown in the statement below—

Name of work.	Province.	Area irrigated in 1899-1900.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Return on Capital outlay.
		Acres.	Rs.	Rs.	Per cent.
Swat River Canal ...	Punjab ...	158,106	41,29,684	3,95,393	9·57
Betwa Canal ...	North-Western Provinces.	36,622	43,74,320	—8,847	...
Rushikulya Project ...	Madras ...	81,794	47,46,149	42,075	0·89
Mhaswad Tank ...	Bombay ...	13,656	20,75,411	13,216	0·64
Nira Canal ...	Do. ...	27,200	56,83,300	84,832	1·49
Total 1899-1900 ...		317,378	2,10,08,864	5,26,669	2·51
Total 1898-99 ...		302,745	2,07,87,660	4,77,230	2·30
Total 1897-98 ...		308,575	2,06,87,255	3,98,335	1·92

The Swat River Canal although sanctioned as a Protective work has proved a highly remunerative work which might have been constructed as a Productive work. The remaining four works are never likely to prove remunerative, and the Betwa has seldom paid even its working expenses. An estimate was sanctioned during the year for increasing the storage capacity above the head works which will increase the efficiency of the work and perhaps cause a slight improvement in the returns.

13. The particulars given in the following statement relate to all Major works, *i.e.*, to Productive and Protective works taken together—

Province.	Area irrigated.	Estimated value of crops.	Average value of crops per acre.	Average rate of revenue assessed per acre.	Working expenses rate per acre irrigated.	Percentage of working expenses on gross revenue.
	Acres.	Rs.	Rs.	Rs.	Rs.	Per cent.
Punjab Imperial ...	3,893,635	14,63,70,008	37·6	3·5	1·1	30·8
Punjab Native States ...	491,337	1,75,09,228	35·6	3·6	1·1	31·8
North-Western Provinces	2,653,494	9,51,75,501	36·0	3·6	1·1	31·8
Madras	2,768,668	5,38,27,789	19·4	4·0	0·9	20·7
Sind	808,140	1,81,43,339	22·5	1·9	0·5	24·5
Bombay	67,227	39,47,302	58·7	6·6	3·5	39·2
Bengal	727,026	2,52,49,750	34·7	1·9	1·9	76·9
Total ...	11,409,527	36,02,22,917	31·6	3·4	1·1	30·3

The rate of working expenses per acre irrigated and their percentage on gross revenue necessarily vary in each Province, though there is a remarkable uniformity in both the acreage rate and percentage in the Punjab and the North Western Provinces, in which all conditions are very similar. The high maintenance rates in Bengal and Bombay are due to the small areas irrigated in comparison with the cost of works, and the very low rate of assessment in the former province partly accounts for the high percentage on gross revenue. The maintenance rates per acre for each Province have remained remarkably constant during the last five years in Sind, Madras and the Punjab, and in other Provinces the fluctuations have been slight.

Minor Works.

14. All expenditure incurred in the construction and development of Minor Irrigation works is met from revenue. The works are treated as Provincial in all Provinces except Sind, Bombay, Baluchistan, Rajputana and the Punjab, in which all but a few works are Imperial. Capital and Revenue accounts are kept for 78 of the larger and more important Minor works, including 6 purely navigation works and the following statement shows the financial results attained during the year under review.

Province.	Number of works.	Area irrigated.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Percentage of net revenue on capital outlay.	Rate of Revenue assessed per acre.
Irrigation.		Acres.	Rs.	Rs.	Per cent.	Rs.
Sind	7	764,317*	39,75,795	7,24,800	18·23	2·2
Punjab	5	572,922	22,26,202	2,82,557	12·69	1·9
Madras	23	517,676	95,37,061	5,00,912	5·25	3·2
North-Western Provinces	4	177,451	29,12,764	84,697	2·91	1·9
Bombay	27	38,602	71,73,691	4,555	0·06	2·9
Rajputana ...	3	13,396	28,25,210	—2,07,197	...	7·0
Baluchistan ...	2	3,091	16,12,782	—5,987	...	6·0
Bengal	1	...	7,06,560	1,505	0·21	...
Burma (Embankments)	...	424,774	33,70,009	5,31,414	15·76	2·0
Total Irrigation—						
1899-1900 ...	72	2,512,229	3,43,40,074	19,17,256	5·58	2·3
1898-99 ...	72	2,619,926	3,33,33,810	29,78,660	8·93	2·4
1897-98 ...	72	2,915,560	3,27,47,010	32,32,770	9·87	2·2
Navigation 1899-1900.						
Madras	4	...	92,90,281	—24,553	...	...
Bengal	2	...	1,09,64,730	1,48,468	1·38	...
Total Navigation ...	6	...	2,02,55,011	1,23,915	0·61	...

* In the review of Irrigation for the previous year the area irrigated in Sind was wrongly shown as 981,049 acres in place of 769,017 acres.

15. The capital outlay during the year on Irrigation works amounted to Rs. 10,21,295, of which Rs. 3,58,030 were spent in Rajputana, and mostly represents normal outlay on Famine Relief Works though no details of the works

have been given in the Revenue Report. About the same amount was spent in Madras on the improvement of existing works, and Rs. 1,02,467 were spent on the works in Bombay. Capital expenditure was also incurred on the improvement or extension of existing works in the North Western Provinces, Punjab and Sind, but the total amount in each province was less than Rs. 1,00,000.

16. The areas irrigated by these works and the financial results attained compare unfavourably with those of the two previous years. There is a decrease of area in all provinces except the North Western Provinces, where there is an increase of 10,247 acres as compared with the area of 1897-98. The Punjab area was little more than half the average of the previous five years owing to the low supply level in the rivers from which the inundation canals are supplied. Madras was about 30,000 acres below the average in consequence of unfavourable rainfall, and there was a more than proportionate reduction in the gross revenue. In the North Western Provinces the net revenue has not increased with the increase in area, partly in consequence of higher maintenance charges, and partly because much of the increase in assessments will not be realized until the following year.

The area irrigated by the Bombay works was not much below the average, but there is a considerable reduction in the net revenue, due partly to expenditure in maintenance undertaken to provide employment for famine labour and partly to an increase in the balances of revenue outstanding, which is attributed to the effects of famine and plague. There was a serious decrease in the area irrigated by the works in Rajputana, as compared with 38,303 acres in 1897-98 and 25,592 in 1898-99. This was entirely attributable to the short rainfall, which also accounts for the decrease in area in Baluchistan. In both these provinces the gross revenue for the year was much less than the working expenses.

The area shown in Burma is not under irrigation, but represents the area of cultivation on lands reclaimed by river flood embankments, the revenue assessed on which is creditable to the capital account of the works. The area in 1899-1900 is somewhat less than reported for the two previous years.

The Minor Navigation works in Madras shew a loss in working of Rs. 24,553 against Rs. 12,370 in the previous year, and a net revenue of Rs. 9,830 in 1897-98. In Bengal also the net revenue due to Minor Navigation works has fallen from Rs. 2,49,210 in 1897-98 to Rs. 1,48,468 in the year under review, but works of this class are never likely to be remunerative.

17. There are a number of Minor Works for which separate Capital accounts are not kept, either because the works are too small or because they have not been constructed by the British Government, which has merely undertaken their improvement and maintenance. Revenue accounts only are maintained for such works, which are credited with the land revenue depending on their maintenance and debited with all expenditure incurred on construction, extension, improvements or maintenance. Particulars for the year 1899-1900 are shown by Provinces in the statement below.

Minor Works for which only Revenue Accounts are kept.

1899-1900.

Provinces.	Area irrigated.	Revenue receipts.	Charges.	Net revenue.
	Acres.	Rs.	Rs.	Rs.
Burma	519,590	19,04,588	12,54,878	6,49,710
Bengal	...	1,15,321	1,13,731	1,590
Punjab	257,153	3,90,773	1,85,316	2,05,457
Bombay	131,908	4,88,411	1,70,882	3,17,529
Sind	977,520	21,66,254	9,66,657	11,99,597
Total 1899-1900	1,886,171	50,65,347	26,91,464	23,73,883
1898-99	1,925,661	48,70,462	23,46,203	25,24,259
1897-98	1,969,690	46,75,498	18,42,364	28,33,124

The small decrease in total area irrigated as compared with the previous year is due to low rivers and to an unfavourable season.

18. There is a third important class of Minor works in the Madras Presidency for which neither Capital nor Revenue accounts are kept. These include

28,539 tanks and 6,297 irrigation channels, improvements and repairs of which are executed by the Public Works Department, or, in the case of the smaller works by the Civil officers, the expenditure during 1899-1900, amounting to Rs. 20,32,697, of which about one-fifth was spent by the Civil officers. The areas charged as irrigated by these small works in 1899-1900 aggregated 2,827,938 acres or more than all the Major works in the Presidency taken together, and the revenue derived therefrom amounted to Rs. 72,07,545, the corresponding figures for the previous year being 3,350,560 acres and Rs. 89,92,121. The decrease in area and revenue is due to the unfavourable character of the season which necessitated large remissions of revenue in ten out of the twenty districts in which these works abound. Important as are these works in the aggregate it is hardly possible to determine what share of the revenue dependent on them is due to the expenditure incurred by Government on their up-keep and on this account continuous revenue accounts have not been maintained.

19. The Capital outlay incurred on Productive Works has not been met entirely from loan funds, but the following statement shows the result of expenditure on irrigation and navigation works in India as far as they affect the general tax-payer. In this statement the transactions on works for which no continuous revenue accounts are kept, such as those referred to in the preceding paragraph, have been excluded; the charges against capital include Rs. 72,14,441 incurred on the Productive Works still under construction, and other charges against capital for works or extensions which are not yet fully developed. The figures in this statement differ from those in the note by the Accountant General as they include the outlay on surveys and on works which have been abandoned.

—	During 1899-1900.	To end of 1899-1900.
MAJOR WORKS.	Rs.	Rs.
Productive works—		
Direct capital outlay from borrowed money ...	82,69,400	26,41,59,038
Direct capital outlay charged against revenue ...	90,915	5,61,42,145
Indirect charges debitable to capital ...	2,87,056	1,58,70,280
Working expenses (direct and indirect) ...	1,03,26,810	21,33,86,367
Interest on borrowed capital	1,03,86,974	18,51,14,244
Total charges	2,10,91,755	47,05,13,036
Total revenue	3,29,18,520	57,50,89,779
Surplus revenue	1,18,26,765	10,45,76,743
Protective works—		
Direct capital outlay charged against revenue ...	3,58,946	2,07,79 696
Indirect charges debitable to capital ...	14,229	12,05,856
Working expenses (direct and indirect) ...	2,85,354	38,43,393
Total charges	6,58,529	2,58,28,945
Total revenue	8,12,023	63,50,771
Surplus revenue	1,53,494	—1,94,78,174
MINOR WORKS.		
Works for which Capital and Revenue accounts are kept		
Direct Capital outlay charged against revenue ...	9,56,532	5,31,06,456
Indirect charges debitable to capital ...	42,750	26,71,441
Working expenses (direct and indirect) ...	28,11,238	6,52,18,050
Total charges	38,10,520	12,09,95,947
Total revenue	48,52,409	14,10,91,335
Surplus revenue	10,41,889	2,00,95,388
Works for which only Revenue accounts are kept.		
Total charges	26,91,464	* 4,56,41,311
Total revenue	50,65,347	8,91,50,281
Surplus revenue	23,73,883	4,35,08,970
Total surplus revenue, Major and Minor Works...	1,53,96,031	14,87,02,927

* Exclusive of indirect charges in Bombay to end of 1898-99, as the figures are not available.

The foregoing statement shows the results of the expenditure incurred on irrigation works, when regarded solely as a financial investment, without reference to its economic value in increasing the food supplies, in preventing famine and in strengthening the position of the owners and occupiers of the land. Its value in this respect is indicated by the fact that the total area of crops irrigated or protected by the different classes of works during the year under review exceeded $18\frac{1}{2}$ million acres.

ORDER.—Ordered, that this Review, with a copy of the note by the Accountant General, Public Works Department, be forwarded to the Finance and Commerce and Revenue and Agricultural Departments, and to the Local Governments and Administrations in the Public Works Department, noted on the margin, for information.

The Governments of Madras, Bombay, Bengal, the North-Western Provinces and Oudh, the Punjab and Burma.
The Honourable the Chief Commissioners of the Central Provinces, Assam and Coorg.
The Honourable the Resident at Hyderabad.
The Honourable the Agents to the Governor General for Central India, Rajputana and Baluchistan.
The Accountant General, Public Works Department.

Ordered also, that the Review be published in Part I of the *Gazette of India*, and the note in the Supplement thereto.

Ordered further, that a copy of the review and note be forwarded to His Majesty's Secretary of State for India for information.

T. HIGHAM,
Secy. to the Govt. of India.

Document accompanying.

Note by the Accountant General, Public Works Department, dated 11th April 1901.

G. C, Press, Simla.—No. 524 P. W. D.—26-7-01.—500.

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Note by A. R. Becher, Esq., Accountant General, Public Works Department, upon the accounts of Revenue and Expenditure of Irrigation Works in India for 1899-1900.

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Irrigation Works are divided into two main classes, Major and Minor Works, the former being sub-divided into (I) Productive and (II) Protective Works. Capital and Revenue accounts are kept for all Major Works, and the revenue due to them, whether directly, in the form of water rates and miscellaneous receipts, or indirectly on account of enhancements of land revenue due to irrigation are shown in the annual Finance accounts. In the case of Minor Works direct revenue receipts only appear in the Finance accounts, the indirect revenue being included in the receipts under the head of Land Revenue. As regards expenditure the Finance accounts show all direct charges for both classes of works, but not the indirect charges on account of capitalization of abatements of land revenue and of leave and pension allowances. The Accountant General's note, showing the financial position of the works in both classes, is therefore based on the Finance accounts as regards all revenue from and direct expenditure on Major Works and all direct revenue receipts and expenditure on Minor Works, and on the Administrative accounts and Revenue Reports of the Public Works Department in respect of the indirect revenue due to Minor Works, indirect charges to both Major and Minor Works, and all other particulars such as the areas irrigated and the rates of assessment and maintenance.

Major Works.

2. The most important irrigation works in India are those classed as Productive, or works the capital cost of which has been wholly or mainly provided from loan funds, in the expectation that the works would prove directly remunerative, and that the net revenue derivable from them would fully cover all charges for interest within a reasonable time after the completion of the works. This expectation has not been realized in respect of any of the four Productive works which have been constructed in Bengal, and of the seven in the Bombay Deccan and Gujarat, and also of two works in Madras, the Kurnool-Cuddapah canal and the Barur Tank Project. The capital outlay recorded against these thirteen works to the end of the year under review amounted to Rs. 9,73,85,398, on which the net revenue realized during the year yielded a return of 0·79 per cent. only, the corresponding returns for the years 1898-99 and 1897-98 being 0·71 and 0·94 respectively. The interest charges to the end of the year had exceeded the net revenue by Rs. 8,35,80,611, the excess for the year being Rs. 30,37,749. The area irrigated by these works during the year amounted to 836,177 acres.

The unfavourable financial results on these thirteen works are, however, more than balanced by those attained on the twenty two other Productive works now in operation, the net revenue on which during the year under review was equivalent to a return of 9·42 per cent. on the capital outlay. Taking all the thirty five works together the capital cost to end of the year amounted to Rs. 32,89,57,022, and the net revenue to Rs. 2,25,91,710, the net return being 6·87 per cent. The net revenue for the year exceeded the interest charges by Rs. 1,01,55,867. These figures do not include the capital cost of the sections of the Sirhind and Western Jumna canals in the Punjab which has been met by contributions from Native States, or the net revenue creditable thereto.

3. These results are shown separately by Provinces in the following statement which also includes the transactions in the Punjab Native States. The totals are brought into comparison with those of the previous year, and also with those of the famine year of 1897-98, in which the corresponding totals were in excess of all previous records.

Province.	Number of works.	Area irrigated.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Percentage of net revenue on capital outlay.
		Acres.	Rs.	Rs.	
Irrigation.					
Punjab	6	3,735,529	8,68,17,532	88,90,554	10·24
North Western Provinces ...	5	2,616,872	8,28,56,978	63,91,209	7·71
Madras	8	2,686,874	6,72,87,979	54,59,527	8·12
Sind	5	808,140	1,67,61,548	11,56,907	6·90
Bombay	7	26,371	1,09,78,486	2,68,317	2·44
Bengal	3	727,026	6,16,39,257	4,17,120	0·68
Do.	*1	...	26,15,242	8,076	0·31
Total Irrigation and Navigation, Imperial.	35	10,600,812	32,89,57,022	2,25,91,710	6·87
Native States, Punjab ...	†	491,337	1,51,86,970	12,07,415	7·95
Grand total Imperial and Native States,—					
1899-1900 ...	35	11,092,149	34,41,43,992	2,37,99,125	6·92
1898-99 ...	34	9,964,921	33,08,81,149	2,25,04,533	6·80
1897-98 ...	34	10,340,576	32,73,68,760	2,45,36,733	7·50

* Hijili Tidal Canal which is a purely navigation work.
† Part of the works in the Punjab.

Two new works were brought into operation during the year under review, *viz.*, the Jamrao canal in Sind, and the Fattehpur branch of the Ganges Canal in the North-Western Provinces; on the other hand the number of works in Madras has been reduced from 9 to 8, by the amalgamation of the Sangam-Anicut project with the Penner River Canals, of which system it forms a part.

4. All Provinces have contributed to the very satisfactory increase of 751,573 acres as compared with the area irrigated in 1897-98, with the exception of Bombay (Deccan and Gujarat) where a decrease of 6,700 acres is shown, but the principal increases have been in the Punjab, the North-Western Provinces and Sind. The areas in Bengal and the North-Western Provinces were, however, exceeded in the famine year 1896-97 when they stood at 805,387 and 2,758,600 acres respectively, and the Madras area was exceeded by 5,943 acres only in 1898-99. The areas in the Punjab and Sind were in excess of all previous records.

1/639 (7)

The total value of the crops irrigated from productive works during the year is estimated at Rs. 34,98,57,579, which is slightly in excess of the total capital cost.

5. The area irrigated by the productive works in the Punjab exceeded the previous record of 1897-98 by 309,525 acres. An increase occurred, however, only on two works, the Chenab and the Sirhind canals. On the former canal the development of irrigation continues to be very remarkable. The area recorded in 1897-98 was 810,000 acres, but rose in the year under review to 1,353,223 acres, and there is no doubt that this area will be considerably exceeded in future. The increase in the Sirhind canal amounted to 164,487, of which 96,127 acres occurred on the Native States Branches, and the area irrigated on these branches corresponded more closely with the share of the supply assigned to the States than has hitherto been the case. This indicates an improvement in the management of the irrigation in the States which is very satisfactory.

The increase of 707,710 acres on these two canals was partially balanced by a decrease on the four other productive works in the Punjab, which amounted in the aggregate to 398,185 acres. This decrease was entirely due to the short supply in the rivers Jumna, Sutlej and Ravi. The decrease in the case of the Sidhnai canal is very remarkable. In 1897-98 the area irrigated amounted to 185,709 acres, but only 26,265 acres were recorded during the year under review. This is the smallest area which has been irrigated since the first year in which the canal was in operation (1886). This canal has hitherto been one of the most remunerative in the Punjab. During the twelve years ending 1898-99, the return on the capital outlay has varied from 10·88 per cent. as a minimum to 22·28 per cent., but in 1899-1900 the working showed a loss of 4·68 per cent. The explanation is that the river supply failed almost entirely, water being available for only 117 days in the year as compared with an average of 245 days during the previous ten years.

The return on the capital expenditure by Native States on the Sirsa branch, Western Jumna Canal and on the Sirhind Canal, amounted to 7·95 per cent., which is the highest yet recorded. The Patiala section of the Sirsa branch has always been remunerative, but the financial prospects of the Native States branches of the Sirhind canal were for many years very unfavourable. Since 1896-97, however, the returns have varied between $5\frac{1}{2}$ and $6\frac{1}{2}$ per cent., and amounted to 7·55 per cent. during the year. The financial success of these branches appears to be now satisfactorily established, while their great protective value is shown by the fact that nearly half a million acres were irrigated from them in this year of drought.

6. The total area irrigated by productive works in the North Western Provinces is second only to that of 1896-97, but as in the Punjab the conditions of supply in the rivers were very unfavourable. The rains practically ceased in the beginning of August in most of the canal districts and from then until the middle of January the demand for water was intense, but the supply in the Ganges was the lowest ever known. The fact that so large an area was successfully matured must be regarded as very satisfactory.

The new Fattehpur branch, Ganges canal, was brought into operation during the year, and 23,280 acres were reported as irrigated.

7. The returns in Madras are as usual heavily weighted by the unremunerative Kurnool-Cuddapah canal, which paid only 0·29 per cent. on its capital cost of Rs. 2,17,26,872, during the year under review. Although this work is never likely to be remunerative there has been a marked and satisfactory improvement during the last four years. The average annual irrigation during the five years ending 1895-96 was only 32,160 acres, and the gross revenue only just covered the working expenses. During the famine year of 1896-97, 87,226 acres were irrigated. The area fell to about 48,000 in each of the two following years, but rose again to 77,216 acres in the year under review. The Periyar project on which irrigation commenced in 1896-97 with an area of 63,751 acres has not yet proved remunerative but appears to be developing satisfactorily, the area having increased gradually to 12[illegible],232 acres in 1899-1900, when the net revenue yielded a return of 2·47 per cent. on the capital outlay.

8. In Sind the Jamrao canal was opened in November 1899 and 8,160 acres were irrigated before the close of the year. The large increase in the total irrigated area in this Province is satisfactory; but full particulars cannot be given as the revenue report has not yet been received.

9. The area irrigated in the Bombay, Deccan and Gujarat was slightly less than in the two preceding years, but the return on the capital outlay was higher, having risen from 1·28 per cent. in 1897-98 to 2·44 per cent. in 1899-1900. This is due to an increasing percentage of the higher class crops.

10. In Bengal the irrigated area was above the average. The Sone canals yielded a net revenue of Rs. 4,96,114, equivalent to a return of 1·85 per cent. on the capital cost, but as usual the gross revenue on the Orissa and Midnapore canals did not fully cover the working expenses. The Hijili canal which is purely a navigation canal paid 0·31 per cent. only on the capital cost. The navigation receipts on the Bengal canals have suffered from the completion of the Bengal-Nagpur railway.

11. In addition to the 35 Productive works now in operation five new works were under construction during the year, *viz.*, the Jhelum canal in the Punjab, the Mandalay canal in Upper Burma and the Dad, Naulakhi and Nasrat canals in Sind. The total outlay on these works to the end of the year (excluding interest charges) amounted to Rs. 72,14,441 of which Rs. 44,29,965 were expended during the year. In addition Rs. 49,17,406 were spent on works now in operation, principally on extensions or improvements which are likely to prove remunerative and to increase the efficiency of these works. The total capital expenditure during the year therefore amounted to Rs. 93,47,371 against Rs. 69,49,914 in the previous year.

It is anticipated that the two principal works now under construction, the Jhelum and Mandalay canals, will commence irrigation in 1901-02.

12. Protective Irrigation works are those that have been sanctioned in consideration of their value as famine protective works, but without any expectation of their becoming directly remunerative. Funds for their construction have, therefore, not been borrowed, but are provided from the famine grant. There are at present five of these works in operation, particulars of which are shown in the statement below—

Name of work.	Province.	Area irrigated in 1899-1900.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Return on Capital outlay.
		Acres.	Rs.	Rs.	Per cent.
Swat River Canal ...	Punjab ...	158,106	41,29,684	3,95,393	9·57
Betwa Canal ...	North-Western Provinces.	36,622	43,74,320	—8,847	...
Rushikulya Project ...	Madras ...	81,794	47,46,149	42,075	0·89
Mhaswad Tank ...	Bombay ...	13,656	20,75,411	13,216	0·64
Nira Canal ...	Do. ...	27,200	56,83,300	84,832	1·49
Total 1899-1900	...	317,378	2,10,08,864	5,26,669	2·51
Total 1898-99	...	302,745	2,07,87,660	4,77,230	2·30
Total 1897-98	...	308,575	2,06,87,255	3,98,335	1·92

The Swat River Canal although sanctioned as a Protective work has proved a highly remunerative work which might have been constructed as a Productive work. The remaining four works are never likely to prove remunerative, and the Betwa has seldom paid even its working expenses. An estimate was sanctioned during the year for increasing the storage capacity above the head works which will increase the efficiency of the work and perhaps cause a slight improvement in the returns.

8/638

(8)

13. The particulars given in the following statement relate to all Major works, *i.e.*, to Productive and Protective works taken together—

Province.	Area irrigated.	Estimated value of crops.	Average value of crops per acre.	Average rate of revenue assessed per acre.	Working expenses rate per acre irrigated.	Percentage of working expenses on gross revenue.
	Acres,	Rs.	Rs.	Rs.	Rs.	Per cent.
Punjab Imperial ...	3,893,635	14,63,70,008	37·6	3·5	1·1	30·8
Punjab Native States ...	491,337	1,75,09,228	35·6	3·6	1·1	31·8
North-Western Provinces	2,653,494	9,51,75,501	36·0	3·6	1·1	31·8
Madras	2,768,668	5,38,27,789	19·4	4·0	0·9	20·7
Sind	808,140	1,81,43,339	22·5	1·9	0·5	24·5
Bombay	67,227	39,47,302	58·7	6·6	3·5	39·2
Bengal	727,026	2,52,49,750	34·7	1·9	1·9	76·9
Total ...	11,409,527	36,02,22,917	31·6	3·4	1·1	30·3

The rate of working expenses per acre irrigated and their percentage on gross revenue necessarily vary in each Province, though there is a remarkable uniformity in both the acreage rate and percentage in the Punjab and the North Western Provinces, in which all conditions are very similar. The high maintenance rates in Bengal and Bombay are due to the small areas irrigated in comparison with the cost of works, and the very low rate of assessment in the former province partly accounts for the high percentage on gross revenue. The maintenance rates per acre for each Province have remained remarkably constant during the last five years in Sind, Madras and the Punjab, and in other Provinces the fluctuations have been slight.

Minor Works.

14. All expenditure incurred in the construction and development of Minor Irrigation works is met from revenue. The works are treated as Provincial in all Provinces except Sind, Bombay, Baluchistan, Rajputana and the Punjab, in which all but a few works are Imperial. Capital and Revenue accounts are kept for 78 of the larger and more important Minor works, including 6 purely navigation works and the following statement shows the financial results attained during the year under review.

Province.	Number of works.	Area irrigated.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Percentage of net revenue on capital outlay.	Rate of Revenue assessed per acre.
Irrigation.		Acres.	Rs.	Rs.	Per cent.	Rs.
Sind	7	764,317*	39,75,795	7,24,800	18·23	2·2
Punjab	5	572,922	22,26,202	2,82,557	12·69	1·9
Madras	23	517,676	95,37,061	5,00,912	5·25	3·2
North-Western Provinces	4	177,451	29,12,764	84,697	2·91	1·9
Bombay	27	38,602	71,73,691	4,555	0·06	2·9
Rajputana ...	3	13,396	28,25,210	—2,07,197	...	7·0
Baluchistan ...	2	3,091	16,12,782	—5,987	...	6·0
Bengal	1	...	7,06,560	1,505	0·21	...
Burma (Embankments)	...	424,774	33,70,009	5,31,414	15·76	2·0
Total Irrigation—						
1899-1900 ...	72	2,512,229	3,43,40,074	19,17,256	5·58	2·3
1898-99 ...	72	2,619,926	3,33,33,810	29,78,660	8·93	2·4
1897-98 ...	72	2,915,560	3,27,47,010	32,32,770	9·87	2·2
Navigation 1899-1900.						
Madras	4	...	92,90,281	—24,553	...	...
Bengal	2	...	1,09,64,730	1,48,468	1·38	...
Total Navigation ...	6	...	2,02,55,011	1,23,915	0·61	...

* In the review of Irrigation for the previous year the area irrigated in Sind was wrongly shown as 981,049 acres in place of 769,017 acres.

15. The capital outlay during the year on Irrigation works amounted to Rs. 10,21,295, of which Rs. 3,58,030 were spent in Rajputana, and mostly represents normal outlay on Famine Relief Works though no details of the works

have been given in the Revenue Report. About the same amount was spent in Madras on the improvement of existing works, and Rs. 1,02,467 were spent on the works in Bombay. Capital expenditure was also incurred on the improvement or extension of existing works in the North Western Provinces, Punjab and Sind, but the total amount in each province was less than Rs. 1,00,000.

16. The areas irrigated by these works and the financial results attained compare unfavourably with those of the two previous years. There is a decrease of area in all provinces except the North Western Provinces, where there is an increase of 10,247 acres as compared with the area of 1897-98. The Punjab area was little more than half the average of the previous five years owing to the low supply level in the rivers from which the inundation canals are supplied. Madras was about 30,000 acres below the average in consequence of unfavourable rainfall, and there was a more than proportionate reduction in the gross revenue. In the North Western Provinces the net revenue has not increased with the increase in area, partly in consequence of higher maintenance charges, and partly because much of the increase in assessments will not be realized until the following year.

The area irrigated by the Bombay works was not much below the average, but there is a considerable reduction in the net revenue, due partly to expenditure in maintenance undertaken to provide employment for famine labour and partly to an increase in the balances of revenue outstanding, which is attributed to the effects of famine and plague. There was a serious decrease in the area irrigated by the works in Rajputana, as compared with 38,303 acres in 1897-98 and 25,592 in 1898-99. This was entirely attributable to the short rainfall, which also accounts for the decrease in area in Baluchistan. In both these provinces the gross revenue for the year was much less than the working expenses.

The area shown in Burma is not under irrigation, but represents the area of cultivation on lands reclaimed by river flood embankments, the revenue assessed on which is creditable to the capital account of the works. The area in 1899-1900 is somewhat less than reported for the two previous years.

The Minor Navigation works in Madras shew a loss in working of Rs. 24,553 against Rs. 12,370 in the previous year, and a net revenue of Rs. 9,8[illegible]0 in 1897-98. In Bengal also the net revenue due to Minor Navigation works has fallen from Rs. 2,49,210 in 1897-98 to Rs. 1,48,468 in the year under review, but works of this class are never likely to be remunerative.

17. There are a number of Minor Works for which separate Capital accounts are not kept, either because the works are too small or because they have not been constructed by the British Government, which has merely undertaken their improvement and maintenance. Revenue accounts only are maintained for such works, which are credited with the land revenue depending on their maintenance and debited with all expenditure incurred on construction, extension, improvements or maintenance. Particulars for the year 1899-1900 are shown by Provinces in the statement below.

Minor Works for which only Revenue Accounts are kept.

1899-1900.

Provinces.	Area irrigated.	Revenue receipts.	Charges.	Net revenue.
	Acres.	Rs.	Rs.	Rs.
Burma	519,590	19,04,588	12,54,878	6,49,710
Bengal	...	1,15,321	1,13,731	1,590
Punjab	257,153	3,90,773	1,85,316	2,05,457
Bombay	131,908	4,88,411	1,70,882	3,17,529
Sind	977,520	21,66,254	9,66,657	11,99,597
Total 1899-1900	1,886,171	50,65,347	26,91,464	23,73,883
1898-99	1,925,661	48,70,462	23,46,203	25,24,259
1897-98	1,969,690	46,75,498	18,42,364	28,33,124

The small decrease in total area irrigated as compared with the previous year is due to low rivers and to an unfavourable season.

18. There is a third important class of Minor works in the Madras Presidency for which neither Capital nor Revenue accounts are kept. These include

9/635

(9)

28,539 tanks and 6,297 irrigation channels, improvements and repairs of which are executed by the Public Works Department, or, in the case of the smaller works by the Civil officers, the expenditure during 1899-1900, amounting to Rs. 20,32,697, of which about one-fifth was spent by the Civil officers. The areas charged as irrigated by these small works in 1899-1900 aggregated 2,827,938 acres or more than all the Major works in the Presidency taken together, and the revenue derived therefrom amounted to Rs. 72,07,545, the corresponding figures for the previous year being 3,350,560 acres and Rs. 89,92,121. The decrease in area and revenue is due to the unfavourable character of the season which necessitated large remissions of revenue in ten out of the twenty districts in which these works abound. Important as are these works in the aggregate it is hardly possible to determine what share of the revenue dependent on them is due to the expenditure incurred by Government on their up-keep and on this account continuous revenue accounts have not been maintained.

19. The Capital outlay incurred on Productive Works has not been met entirely from loan funds, but the following statement shows the result of expenditure on irrigation and navigation works in India as far as they affect the general tax-payer. In this statement the transactions on works for which no continuous revenue accounts are kept, such as those referred to in the preceding paragraph, have been excluded; the charges against capital include Rs. 72,14,441 incurred on the Productive Works still under construction, and other charges against capital for works or extensions which are not yet fully developed. The figures in this statement differ from those in the note by the Accountant General as they include the outlay on surveys and on works which have been abandoned.

—	During 1899-1900.	To end of 1899-1900.
MAJOR WORKS.	Rs.	Rs.
Productive works—		
Direct capital outlay from borrowed money ...	89,69,400	26,41,59,038
Direct capital outlay charged against revenue ...	90,915	5,61,42,145
Indirect charges debitable to capital ...	2,87,056	1,58,70,280
Working expenses (direct and indirect) ...	1,03,26,810	21,33,86,367
Interest on borrowed capital	1,03,86,974	18,51,14,244
Total charges	2,10,91,755	47,05,13,036
Total revenue	3,29,18,520	57,50,89,779
Surplus revenue	1,18,26,765	10,45,76,743
Protective works—		
Direct capital outlay charged against revenue ...	3,58,946	2,07,79 696
Indirect charges debitable to capital ...	14,229	12,05,856
Working expenses (direct and indirect) ...	2,85,354	38,43,393
Total charges	6,58,529	2,58,28,945
Total revenue	8,12,023	63,50,771
Surplus revenue	1,53,494	—1,94,78,174
MINOR WORKS.		
Works for which Capital and Revenue accounts are kept		
Direct Capital outlay charged against revenue ...	9,56,532	5,31,06,456
Indirect charges debitable to capital ...	42,750	26,71,441
Working expenses (direct and indirect) ...	28,11,238	6,52,18,050
Total charges	38,10,520	12,09,95,947
Total revenue	48,52,409	14,10,91,335
Surplus revenue	10,41,889	2,00,95,388
Works for which only Revenue accounts are kept.		
Total charges	26,91,464	* 4,56,41,311
Total revenue	50,65,347	8,91,50,281
Surplus revenue	23,73,883	4,35,08,970
Total surplus revenue, Major and Minor Works...	1,53,96,031	14,87,02,927

* Exclusive of indirect charges in Bombay to end of 1898-99, as the figures are not available.

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The foregoing statement shows the results of the expenditure incurred on irrigation works, when regarded solely as a financial investment, without reference to its economic value in increasing the food supplies, in preventing famine and in strengthening the position of the owners and occupiers of the land. Its value in this respect is indicated by the fact that the total area of crops irrigated or protected by the different classes of works during the year under review exceeded $18\frac{1}{2}$ million acres.

7834 R.A.I.G.

ORDER.—Ordered, that this Review, with a copy of the note by the Accountant General, Public Works Department, be forwarded to the Finance and Commerce and Revenue and Agricultural Departments, and to the Local Governments and Administrations in the Public Works Department, noted on the margin, for information.

The Governments of Madras, Bombay, Bengal, the North-Western Provinces and Oudh, the Punjab and Burma.
The Honourable the Chief Commissioners of the Central Provinces, Assam and Coorg.
The Honourable the Resident at Hyderabad.
The Honourable the Agents to the Governor General for Central India, Rajputana and Baluchistan.
The Accountant General, Public Works Department.

Ordered also, that the Review be published in Part I of the *Gazette of India*, and the note in the Supplement thereto.

Ordered further, that a copy of the review and note be forwarded to His Majesty's Secretary of State for India for information.

T. HIGHAM,
Secy. to the Govt. of India.

Document accompanying.

Note by the Accountant General, Public Works Department, dated 11th April 1901.

G. C, Press, Simla.—No. 524 P. W. D.—26-7-01.—500.

5,000—5-11-00.

Public Works ~~Judicial~~ (1901) Department.

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10/630

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SUBJECT.

Review of Irrigation in India in 1899-1900

Forwarding a —

B No 630 I d/ 20-8-01.

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Issue 14/8/01

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GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

CIVIL WORKS.

Irrigation.

Simla, the 26th July 1901.

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(11)

Review of Irrigation in India in 1899-1900.

Read—

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Irrigation Works are divided into two main classes, Major and Minor Works, the former being sub-divided into (I) Productive and (II) Protective Works. Capital and Revenue accounts are kept for all Major Works, and the revenue due to them, whether directly, in the form of water rates and miscellaneous receipts, or indirectly on account of enhancements of land revenue due to irrigation are shown in the annual Finance accounts. In the case of Minor Works direct revenue receipts only appear in the Finance accounts, the indirect revenue being included in the receipts under the head of Land Revenue. As regards expenditure the Finance accounts show all direct charges for both classes of works, but not the indirect charges on account of capitalization of abatements of land revenue and of leave and pension allowances. The Accountant General's note, showing the financial position of the works in both classes, is therefore based on the Finance accounts as regards all revenue from and direct expenditure on Major Works and all direct revenue receipts and expenditure on Minor Works, and on the Administrative accounts and Revenue Reports of the Public Works Department in respect of the indirect revenue due to Minor Works, indirect charges to both Major and Minor Works, and all other particulars such as the areas irrigated and the rates of assessment and maintenance.

Major Works.

2. The most important irrigation works in India are those classed as Productive, or works the capital cost of which has been wholly or mainly provided from loan funds, in the expectation that the works would prove directly remunerative, and that the net revenue derivable from them would fully cover all charges for interest within a reasonable time after the completion of the works. This expectation has not been realized in respect of any of the four Productive works which have been constructed in Bengal, and of the seven in the Bombay Deccan and Gujarat, and also of two works in Madras, the Kurnool-Cuddapah canal and the Barur Tank Project. The capital outlay recorded against these thirteen works to the end of the year under review amounted to Rs. 9,73,85,398, on which the net revenue realized during the year yielded a return of 0·79 per cent. only, the corresponding returns for the years 1898-99 and 1897-98 being 0·71 and 0·94 respectively. The interest charges to the end of the year had exceeded the net revenue by Rs. 8,35,80,611, the excess for the year being Rs. 30,37,749. The area irrigated by these works during the year amounted to 836,177 acres.

5-8-1

Madras

The unfavourable financial results on these thirteen works are, however, more than balanced by those attained on the twenty two other Productive works now in operation, the net revenue on which during the year under review was equivalent to a return of 9·42 per cent. on the capital outlay. Taking all the thirty five works together the capital cost to end of the year amounted to Rs. 32,89,57,022, and the net revenue to Rs. 2,25,91,710, the net return being 6·87 per cent. The net revenue for the year exceeded the interest charges by Rs. 1,01,55,867. These figures do not include the capital cost of the sections of the Sirhind and Western Jumna canals in the Punjab which has been met by contributions from Native States, or the net revenue creditable thereto.

3. These results are shown separately by Provinces in the following statement which also includes the transactions in the Punjab Native States. The totals are brought into comparison with those of the previous year, and also with those of the famine year of 1897-98, in which the corresponding totals were in excess of all previous records.

Province.	Number of works.	Area irrigated.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Percentage of net revenue on capital outlay.
		Acres.	Rs.	Rs.	
Irrigation.					
Punjab	6	3,735,529	8,68,17,532	88,90,554	10·24
North Western Provinces ...	5	2,616,872	8,28,56,978	63,91,209	7·71
Madras	8	2,686,874	6,72,87,979	54,59,527	8·12
Sind	5	808,140	1,67,61,548	11,56,907	6·90
Bombay	7	26,371	1,09,78,486	2,68,317	2·44
Bengal	3	727,026	6,16,39,257	4,17,120	0·68
Do.	*1	...	26,15,242	8,076	0·31
Total Irrigation and Navigation, Imperial.	35	10,600,812	32,89,57,022	2,25,91,710	6·87
Native States, Punjab ...	†	491,337	1,51,86,970	12,07,415	7·95
Grand total Imperial and Native States,—					
1899-1900 ...	35	11,092,149	34,41,43,992	2,37,99,125	6·92
1898-99 ...	34	9,964,921	33 08,81,149	2,25,04,533	6 80
1897-98 ...	34	10,340,576	32,73,68,760	2,45,36,733	7·50

* Hijili Tidal Canal which is a purely navigation work.
† Part of the works in the Punjab.

Two new works were brought into operation during the year under review, *viz.*, the Jamrao canal in Sind, and the Fattehpur branch of the Ganges Canal in the North-Western Provinces; on the other hand the number of works in Madras has been reduced from 9 to 8, by the amalgamation of the Sangam-Anicut project with the Penner River Canals, of which system it forms a part.

4. All Provinces have contributed to the very satisfactory increase of 751,573 acres as compared with the area irrigated in 1897-98, with the exception of Bombay (Deccan and Gujarat) where a decrease of 6,700 acres is shown, but the principal increases have been in the Punjab, the North-Western Provinces and Sind. The areas in Bengal and the North-Western Provinces were, however, exceeded in the famine year 1896-97 when they stood at 805,387 and 2,758,600 acres respectively, and the Madras area was exceeded by 5,943 acres only in 1898-99. The areas in the Punjab and Sind were in excess of all previous records.

The total value of the crops irrigated from productive works during the year is estimated at Rs. 34,98,57,579, which is slightly in excess of the total capital cost.

5. The area irrigated by the productive works in the Punjab exceeded the previous record of 1897-98 by 309,525 acres. An increase occurred, however, only on two works, the Chenab and the Sirhind canals. On the former canal the development of irrigation continues to be very remarkable. The area recorded in 1897-98 was 810,000 acres, but rose in the year under review to 1,353,223 acres, and there is no doubt that this area will be considerably exceeded in future. The increase in the Sirhind canal amounted to 164,487, of which 96,127 acres occurred on the Native States Branches, and the area irrigated on these branches corresponded more closely with the share of the supply assigned to the States than has hitherto been the case. This indicates an improvement in the management of the irrigation in the States which is very satisfactory.

The increase of 707,710 acres on these two canals was partially balanced by a decrease on the four other productive works in the Punjab, which amounted in the aggregate to 398,185 acres. This decrease was entirely due to the short supply in the rivers Jumna, Sutlej and Ravi. The decrease in the case of the Sidhnai canal is very remarkable. In 1897-98 the area irrigated amounted to 185,709 acres, but only 26,265 acres were recorded during the year under review. This is the smallest area which has been irrigated since the first year in which the canal was in operation (1886). This canal has hitherto been one of the most remunerative in the Punjab. During the twelve years ending 1898-99, the return on the capital outlay has varied from 10·88 per cent. as a minimum to 22·28 per cent., but in 1899-1900 the working showed a loss of 4·68 per cent. The explanation is that the river supply failed almost entirely, water being available for only 117 days in the year as compared with an average of 245 days during the previous ten years.

The return on the capital expenditure by Native States on the Sirsa branch, Western Jumna Canal and on the Sirhind Canal, amounted to 7·95 per cent., which is the highest yet recorded. The Patiala section of the Sirsa branch has always been remunerative, but the financial prospects of the Native States branches of the Sirhind canal were for many years very unfavourable. Since 1896-97, however, the returns have varied between 5½ and 6½ per cent., and amounted to 7·55 per cent. during the year. The financial success of these branches appears to be now satisfactorily established, while their great protective value is shown by the fact that nearly half a million acres were irrigated from them in this year of drought.

6. The total area irrigated by productive works in the North Western Provinces is second only to that of 1896-97, but as in the Punjab the conditions of supply in the rivers were very unfavourable. The rains practically ceased in the beginning of August in most of the canal districts and from then until the middle of January the demand for water was intense, but the supply in the Ganges was the lowest ever known. The fact that so large an area was successfully matured must be regarded as very satisfactory.

The new Fattehpur branch, Ganges canal, was brought into operation during the year, and 23,280 acres were reported as irrigated.

7. The returns in Madras are as usual heavily weighted by the unremunerative Kurnool-Cuddapah canal, which paid only 0·29 per cent. on its capital cost of Rs. 2,17,26,872, during the year under review. Although this work is never likely to be remunerative there has been a marked and satisfactory improvement during the last four years. The average annual irrigation during the five years ending 1895-96 was only 32,160 acres, and the gross revenue only just covered the working expenses. During the famine year of 1896-97, 87,226 acres were irrigated. The area fell to about 48,000 in each of the two following years, but rose again to 77,216 acres in the year under review. The Periyar project on which irrigation commenced in 1896-97 with an area of 63,751 acres has not yet proved remunerative but appears to be developing satisfactorily, the area having increased gradually to 124,232 acres in 1899-1900, when the net revenue yielded a return of 2·47 per cent. on the capital outlay.

8. In Sind the Jamrao canal was opened in November 1899 and 8,160 acres were irrigated before the close of the year. The large increase in the total irrigated area in this Province is satisfactory, but full particulars cannot be given as the revenue report has not yet been received.

9. The area irrigated in the Bombay, Deccan and Gujarat was slightly less than in the two preceding years, but the return on the capital outlay was higher, having risen from 1·28 per cent. in 1897-98 to 2·44 per cent. in 1899-1900. This is due to an increasing percentage of the higher class crops.

10. In Bengal the irrigated area was above the average. The Sone canals yielded a net revenue of Rs. 4,96,114, equivalent to a return of 1·85 per cent. on the capital cost, but as usual the gross revenue on the Orissa and Midnapore canals did not fully cover the working expenses. The Hijili canal which is purely a navigation canal paid 0·31 per cent. only on the capital cost. The navigation receipts on the Bengal canals have suffered from the completion of the Bengal-Nagpur railway.

11. In addition to the 35 Productive works now in operation five new works were under construction during the year, *viz.*, the Jhelum canal in the Punjab, the Mandalay canal in Upper Burma and the Dad, Naulakhi and Nasrat canals in Sind. The total outlay on these works to the end of the year (excluding interest charges) amounted to Rs. 72,14,441 of which Rs. 44,29,965 were expended during the year. In addition Rs. 49,17,406 were spent on works now in operation, principally on extensions or improvements which are likely to prove remunerative and to increase the efficiency of these works. The total capital expenditure during the year therefore amounted to Rs. 93,47,371 against Rs. 69,49,944 in the previous year.

It is anticipated that the two principal works now under construction, the Jhelum and Mandalay canals, will commence irrigation in 1901-02.

12. Protective Irrigation works are those that have been sanctioned in consideration of their value as famine protective works, but without any expectation of their becoming directly remunerative. Funds for their construction have, therefore, not been borrowed, but are provided from the famine grant. There are at present five of these works in operation, particulars of which are shown in the statement below—

Name of work.	Province.	Area irrigated in 1899-1900.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Return on Capital outlay.
		Acres.	Rs.	Rs.	Per cent.
Swat River Canal ...	Punjab ...	158,106	41,29,684	3,95,393	9·57
Betwa Canal ...	North-Western Provinces.	36,622	43,74,320	—8,847	...
Rushikulya Project ...	Madras ...	81,794	47,46,149	42,075	0·89
Mhaswad Tank ...	Bombay ...	13,656	20,75,411	13,216	0·64
Nira Canal ...	Do. ...	27,200	56,83,300	84,832	1·49
Total 1899-1900 ...		317,378	2,10,08,864	5,26,669	2·51
Total 1898-99 ...		302,745	2,07,87,060	4,77,230	2·30
Total 1897-98 ...		308,575	2,06,87,255	3,98,335	1·92

The Swat River Canal although sanctioned as a Protective work has proved a highly remunerative work which might have been constructed as a Productive work. The remaining four works are never likely to prove remunerative, and the Betwa has seldom paid even its working expenses. An estimate was sanctioned during the year for increasing the storage capacity above the head works which will increase the efficiency of the work and perhaps cause a slight improvement in the returns.

13. The particulars given in the following statement relate to all Major works, *i.e.*, to Productive and Protective works taken together—

Province.	Area irrigated.	Estimated value of crops.	Average value of crops per acre.	Average rate of revenue assessed per acre.	Working expenses rate per acre irrigated.	Percentage of working expenses on gross revenue.
	Acres.	Rs.	Rs.	Rs.	Rs.	Per cent.
Punjab Imperial ...	3,893,635	14,63,70,008	37·6	3·5	1·1	30·8
Punjab Native States ...	491,337	1,75,09,228	35·6	3·6	1·1	31·8
North-Western Provinces	2,653,494	9,51,75,501	36·0	3·6	1·1	31·8
Madras	2,768,668	5,38,27,789	19·4	4·0	0·9	20·7
Sind	808,140	1,81,43,339	22·5	1·9	0·5	24·5
Bombay	67,227	39,47,302	58·7	6·6	3·5	39·2
Bengal	727,026	2,52,49,750	34·7	1·9	1·9	76·9
Total ...	11,409,527	36,02,22,917	31·6	3·4	1·1	30·3

The rate of working expenses per acre irrigated and their percentage on gross revenue necessarily vary in each Province, though there is a remarkable uniformity in both the acreage rate and percentage in the Punjab and the North Western Provinces, in which all conditions are very similar. The high maintenance rates in Bengal and Bombay are due to the small areas irrigated in comparison with the cost of works, and the very low rate of assessment in the former province partly accounts for the high percentage on gross revenue. The maintenance rates per acre for each Province have remained remarkably constant during the last five years in Sind, Madras and the Punjab, and in other Provinces the fluctuations have been slight.

Minor Works.

14. All expenditure incurred in the construction and development of Minor Irrigation works is met from revenue. The works are treated as Provincial in all Provinces except Sind, Bombay, Baluchistan, Rajputana and the Punjab, in which all but a few works are Imperial. Capital and Revenue accounts are kept for 78 of the larger and more important Minor works, including 6 purely navigation works and the following statement shows the financial results attained during the year under review.

Province.	Number of works.	Area irrigated.	Capital outlay to end of 1899-1900.	Net revenue in 1899-1900.	Percentage of net revenue on capital outlay.	Rate of Revenue assessed per acre.
Irrigation.		Acres.	Rs.	Rs.	Per cent.	Rs.
Sind	7	764,317*	39,75,795	7,24,800	18·23	2·2
Punjab	5	572,922	22,26,202	2,82,557	12·69	1·9
Madras	23	517,676	95,37,061	5,00,912	5·25	3·2
North-Western Provinces	4	177,451	29,12,764	84,697	2·91	1·9
Bombay	27	38,602	71,73,691	4,555	0·06	2·9
Rajputana ...	3	13,396	28,25,210	—2,07,197	...	7·0
Baluchistan ...	2	3,091	16,12,782	—5,987	...	6·0
Bengal	1	...	7,06,560	1,505	0·21	...
Burma (Embankments)	...	424,774	33,70,009	5,31,414	15·76	2·0
Total Irrigation—						
1899-1900 ...	72	2,512,229	3,43,40,074	19,17,256	5·58	2·3
1898-99 ...	72	2,619,926	3,33,33,810	29,78,660	8·93	2·4
1897-98 ...	72	2,915,560	3,27,47,010	32,32,770	9·87	2·2
Navigation 1899-1900.						
Madras	4	...	92,90,281	—24,553	...	...
Bengal	2	...	1,09,64,730	1,48,468	1·38	...
Total Navigation ...	6	...	2,02,55,011	1,23,915	0·61	...

* In the review of Irrigation for the previous year the area irrigated in Sind was wrongly shown as 981,049 acres in place of 769,017 acres.

15. The capital outlay during the year on Irrigation works amounted to Rs. 10,21,295, of which Rs. 3,58,030 were spent in Rajputana, and mostly represents normal outlay on Famine Relief Works though no details of the works

have been given in the Revenue Report. About the same amou[illegible] spent in Madras on the improvement of existing works, and Rs. 1,02,46[illegible] spent on the works in Bombay. Capital expenditure was also incurre[illegible] improvement or extension of existing works in the North Western P[illegible]s, Punjab and Sind, but the total amount in each province was [illegible]n Rs. 1,00,000.

16. The areas irrigated by these works and the financial resu[illegible]ned compare unfavourably with those of the two previous years. The[illegible] is a decrease of area in all provinces except the North Western Provinces, where there is an increase of 10,247 acres as compared with the area of 1897-98. The Punjab area was little more than half the average of the previous five years owing to the low supply level in the rivers from which the inundation canals are supplied. Madras was about 30,000 acres below the average in consequence of unfavourable rainfall, and there was a more than proportionate reduction in the gross revenue. In the North Western Provinces the net revenue has not increased with the increase in area, partly in consequence of higher maintenance charges, and partly because much of the increase in assessments will not be realized until the following y[illegible]r.

The area irrigated by the Bombay works was not much below the average, but there is a considerable reduction in the net revenue due partly to expenditure in maintenance undertaken to provide employment for famine labour and partly to an increase in the balances of revenue outstanding, which is [illegible]ibuted to the effects of famine and plague. There was a serious decrease in [illegible] area irrigated by the works in Rajputana, as compared with 38,303 acres in [illegible]7-98 and 25,592 in 1898-99. This was entirely attributable to the short [illegible]fall, which also accounts for the decrease in area in Baluchistan. In both [illegible] provinces the gross revenue for the year was much less than the working [illegible]s.

[illegible]rea shown in Burma is not under irrigation, but represents the area o[illegible]n on lands reclaimed by river flood embankments, the revenue asse[illegible]hich is creditable to the capital account of the works. The area in [illegible]0 is somewhat less than reported for the two previous years.

The [illegible]Navigation works in Madras shew a loss in working of Rs. 24,553 [illegible]s. 12,370 in the previous year, and a net revenue of Rs. 9,8[illegible]0 in 1897-98. In Bengal also the net revenue due to Minor Navigation works has fallen from Rs. 2,49,210 in 1897-98 to Rs. 1,48,468 in the year under review, but works of this class are never likely to be remunerative.

17. There are a number of Minor Works for which separate Capital accounts are not kept, either because the works are too small or because they have not been constructed by the British Government, which has merely undertaken their improvement and maintenance. Revenue accounts only are maintained for such works, which are credited with the land revenue depending on their maintenance and debited with all expenditure incurred on construction, extension, improvements or maintenance. Particulars for the year 1899-1900 are shown by Provinces in the statement below.

Minor Works for which only Revenue Accounts are kept.

1899-1900.

Provinces.	Area irrigated.	Revenue receipts.	Charges.	Net revenue.
	Acres.	Rs.	Rs.	Rs.
Burma	519,590	19,04,588	12,54,878	6,49,710
Bengal	...	1,15,321	1,13,731	1,590
Punjab	257,153	3,90,773	1,85,316	2,05,457
Bombay	131,908	4,88,411	1,70,882	3,17,529
Sind	977,520	21,66,254	9,66,657	11,99,597
Total 1899-1900	1,886,171	50,65,347	26,91,464	23,73,883
1898-99	1,925,661	48,70,462	23,46,203	25,24,259
1897-98	1,969,690	46,75,498	18,42,364	28,33,124

The small decrease in total area irrigated as compared with the previous year is due to low rivers and to an unfavourable season.

18. There is a third important class of Minor works in the Madras Presidency for which neither Capital nor Revenue accounts are kept. These include

28,539 tanks and 6,297 irrigation channels, improvements and repairs of which are executed by the Public Works Department, or, in the case of the smaller works by the Civil officers, the expenditure during 1899-1900, amounting to Rs. 20,32,697, of which about one-fifth was spent by the Civil officers. The areas charged as irrigated by these small works in 1899-1900 aggregated 2,827,938 acres or more than all the Major works in the Presidency taken together, and the revenue derived therefrom amounted to Rs. 72,07,545, the corresponding figures for the previous year being 3,350,560 acres and Rs. 89,92,121. The decrease in area and revenue is due to the unfavourable character of the season which necessitated large remissions of revenue in ten out of the twenty districts in which these works abound. Important as are these works in the aggregate it is hardly possible to determine what share of the revenue dependent on them is due to the expenditure incurred by Government on their up-keep and on this account continuous revenue accounts have not been maintained.

19. The Capital outlay incurred on Productive Works has not been met entirely from loan funds, but the following statement shows the result of expenditure on irrigation and navigation works in India as far as they affect the general tax-payer. In this statement the transactions on works for which no continuous revenue accounts are kept, such as those referred to in the preceding paragraph, have been excluded; the charges against capital include Rs. 72,14,441 incurred on the Productive Works still under construction, and other charges against capital for works or extensions which are not yet fully developed. The figures in this statement differ from those in the note by the Accountant General as they include the outlay on surveys and on works which have been abandoned.

—	During 1899-1900.	To end of 1899-1900.
MAJOR WORKS.	Rs.	Rs.
Productive works—		
Direct capital outlay from borrowed money ...	89,69,400	26,41,59,038
Direct capital outlay charged against revenue ...	90,915	5,61,42,145
Indirect charges debitable to capital ...	2,87,056	1,58,70,280
Working expenses (direct and indirect) ...	1,03,26,810	21,33,86,367
Interest on borrowed capital	1,03,86,974	18,51,14,244
Total charges	2,10,91,755	47,05,13,036
Total revenue	3,29,18,520	57,50,89,779
Surplus revenue	1,18,26,765	10,45,76,743
Protective works—		
Direct capital outlay charged against revenue ...	3,58,946	2,07,79 696
Indirect charges debitable to capital ...	14,229	12,05,856
Working expenses (direct and indirect) ...	2,85,354	38,43,593
Total charges	6,58,529	2,58,28,945
Total revenue	8,12,023	63,50,771
Surplus revenue	1,53,494	—1,94,78,174
MINOR WORKS.		
Works for which Capital and Revenue accounts are kept		
Direct Capital outlay charged against revenue ...	9,56,532	5,31,06,456
Indirect charges debitable to capital ...	42,750	26,71,441
Working expenses (direct and indirect) ...	28,11,238	6,52,18,050
Total charges	38,10,520	12,09,95,947
Total revenue	48,52,409	14,10,91,335
Surplus revenue	10,41,889	2,00,95,388
Works for which only Revenue accounts are kept.		
Total charges	26,91,464	*4,56,41,311
Total revenue	50,65,347	8,91,50,281
Surplus revenue	23,73,883	4,35,08,970
Total surplus revenue, Major and Minor Works...	1,53,96,031	14,87,02,927

* Exclusive of indirect charges in Bombay to end of 1898-99, as the figures are not available.

The foregoing statement shows the results of the expenditure incurred on irrigation works, when regarded solely as a financial investment, without reference to its economic value in increasing the food supplies, in preventing famine and in strengthening the position of the owners and occupiers of the land. Its value in this respect is indicated by the fact that the total area of crops irrigated or protected by the different classes of works during the year under review exceeded 18½ million acres.

The Governments of Madras, Bombay, Bengal, the North-Western Provinces and Oudh, the Punjab and Burma.
The Honourable the Chief Commissioners of the Central Provinces, Assam and Coorg.
The Honourable the Resident at Hyderabad.
The Honourable the Agents to the Governor General for Central India, Rajputana and Baluchistan.
The Accountant General, Public Works Department.

ORDER.—Ordered, that this Review, with a copy of the note by the Accountant General, Public Works Department, be forwarded to the Finance and Commerce and Revenue and Agricultural Departments, and to the Local Governments and Administrations in the Public Works Department, noted on the margin, for information.

Ordered also, that the Review be published in Part I of the *Gazette of India*, and the note in the Supplement thereto.

Ordered further, that a copy of the review and note be forwarded to His Majesty's Secretary of State for India for information.

T. Higham.

Secy. to the Govt. of India.

Document accompanying.

Note by the Accountant General, Public Works Department, dated 11th April 1901. } will follow.

G. C. Press, Simla.—No. 524 P. W. D.—26-7-01.—300.

To The Secretary to the Govt of Madras.
Public Works Department.

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